REMARKS

There are no amendments. Claims 1-23 remain pending in this application. Accordingly, no new matter is incorporated by this Amendment.

Rejections under 35 U.S.C. § 102

Claims 1-10, 13-14, and 18-23 are rejected under 35 U.S.C. § 102(e) as purportedly anticipated by Oya et al., U.S. Patent No. 6,479,349. Applicants respectfully traverse.

In paragraph one at page 2, the Office Action states: "In reference to Claims 1 and 19, Oya et al. teaches: ...introducing nitric oxide into the CVD furnace...(See columns 6-7 lines 65-30, column 9 lines 25-35 and 60-65, column 10 lines 59-68 and column 11 lines 19-31)" These portions of Oya et al are set forth below with ***emphasis*** added to certain elements.

> Succeedingly, N_2O with flow volume of about 300-3000 cc is ***supplied into a diffusion furnace*** at about 900-1000 °C. (in this mode, 950 °C.) and N_2O annealing is performed for about 5-10 minutes. As a result, nitrogen atoms (refer to the symbol x in the second silicon oxide film 15 shown in FIG. 5, or the like) are mixed into the second silicon oxide film 15. As a result, the conventional problem (A trap site occurs easily in the boundary portion between the control gate 17 and the second silicon oxide film 15 because of electric charges (electrons) flown out from the floating gate 13 and accelerated by electric field between the control gate and the floating gate to have energy. Because the electric charges (electrons) flown out from the floating gate 13 at the time of erasing operation are trapped in a region of the occurrence of the trap site, erasing efficiency is lowered) can be prevented. That is, when nitrogen atoms are contained in the second silicon oxide film 15 correspondingly to the region of the occurrence of the trap site, free hands of dangling bonds without taking the form of O--Si--O in that region can be terminated by trivalent nitrogen atoms so that dangling bonds can be suppressed. Accordingly, because the occurrence of dangling bonds as electric charge (electron) trap sites is suppressed, the ratio at which electrons flown out from the floating gate at the time of erasing operation are trapped is reduced so that the lowering of erasing efficiency can be suppressed.
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> Although this mode has shown the case where N_2O annealing is performed for nitriding the second silicon oxide film 15, the invention may be applied to the case where heat treatment is performed in a nitriding atmosphere of, for example, ***NO, NH_3, or the like, as well as N_2O.***
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> (See col.6, l.65 to col.7,l.29)

In the above citation from Oya et al, although cited for this proposition in the outstanding Office Action, there is no teaching of introducing nitric oxide (NO) into a Chemical Vapor Deposition (CVD) furnace.

Although the mode of the first embodiment has shown the case where nitridation of the second oxide film 15 is performed by annealing in a diffusion furnace at about 900-1000°C. (in the mode, 950°C.) with supplying N_2O, nitridation of the second oxide film15 may be performed by annealing ***in a low pressure CVD furnace*** at about 800-900°C. without rising the temperature of the CVD furnace. Namely after forming the second oxide film 15 like forming the second oxide film 15 in the fourth step of the first embodiment as shown in FIG. 5, nitridation of the second oxide film 15 may be performed as follows.

After forming the second oxide film 15, succeedingly, only N_2O with flow volume of about 3000-5000 cc ***is supplied into the low pressure CVD furnace*** and ***N_2O annealing*** is performed for about 20-40 minutes.

Furthermore, because the temperature set ***in the low pressure CVD furnace for N_2O*** annealing is selected to be a low temperature of about 800°C. as described above, a larger amount of nitrogen atoms are contained in a region relatively near to a surface of the second silicon oxide film 15.

(See col.9, ll.24-38 and ll.60-65)

In the above citations from Oya et al, although cited for this proposition in the outstanding Office Action, there is no teaching of introducing nitric oxide (NO) into a Chemical Vapor Deposition (CVD) furnace.

> According to the present invention, a CVD oxide film as a tunnel oxide film is formed in **a low pressure CVD furnace** by a low pressure CVD method and then **subjected to heat treatment in a LPCVD furnace in a nitriding atmosphere.** Accordingly, the CVD oxide film can be nitrided, so that the film quality of the CVD oxide film can be improved. Furthermore, the ratio at which electric charges (electrons) flown out from the floating gate at the time of erasing operation are trapped in the CVD oxide film can be reduced
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> (See col.10, ll.59-68)

In the above citations from Oya et al, although cited for this proposition in the outstanding Office Action, there is no teaching of introducing nitric oxide (NO) into a Chemical Vapor Deposition (CVD) furnace.

> Although in the first-third embodiment a split gate type of nonvolatile semiconductor memory device is described, a CVD oxide film subjected to heat

> treatment in a nitriding atmosphere so as to be nitrided, of the present invention is applicable to a tunnel oxide film between a floating gate and a control gate and a tunnel oxide film (gate insulating film) between the floating gate and a semiconductor substrate of a stacked gate type of nonvolatile semiconductor memory device and a tunnel oxide film between the floating gate and the erasing gate of nonvolatile semiconductor memory device further having an exclusive erasing gate. And a gate insulating film using a tunnel oxide of the present invention is also effective.

In the above citations from Oya et al, although cited for this proposition in the outstanding Office Action, there is no teaching of introducing nitric oxide (NO) into a Chemical Vapor Deposition (CVD) furnace. Neither is the teaching to be found in any other portion of Oya et al.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ... claim." Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Also, See MPEP 2131.

Oya et al. does not teach a method of forming a gate oxide layer on a semiconductor substrate comprising forming an oxide layer on the substrate by oxidizing the substrate in a chemical vapor deposition furnace, introducing nitric oxide (NO) gas into the chemical vapor deposition furnace, and nitriding the oxide layer in the presence of the nitric oxide gas.

Neither does Oya et al. teach a method of nitriding a gate oxide layer on a semiconductor substrate comprising nitriding the gate oxide layer in the presence of nitric oxide (NO) gas, wherein the nitriding step is conducted at a temperature of about 800°C or less and at a pressure of about 1 atm or less in a chemical vapor deposition furnace.

Accordingly, Oya et al. fails to anticipate the Claims.

Reconsideration and withdrawal are respectfully requested.

Rejections under 35 U.S.C. § 103

Claims 11, 12, and 23 are rejected under 35 U.S.C. § 103(a) as purportedly unpatentable based on the combination of Oya et al., and Applicants' specification.

Claim 15 is rejected under 35 U.S.C. § 103(a) as purportedly unpatentable based on the combination of Oya et al., and Wu, U.S. Patent No. 6,323,094.

Claim 16 is rejected under 35 U.S.C. § 103(a) as purportedly unpatentable based on Oya et al. alone.

Claim 17 is rejected under 35 U.S.C. § 103(a) as purportedly unpatentable based on the combination of Oya et al. and Van Zant, "Microchip Fabrication, A Practical Guide to Semiconductor Processing" (2000) 4th Ed., McGraw Hill, pgs. 156, 160, 188, 189, 503, 513, and 514.

As noted above, Oya et al. and does not teach, nor does it suggest a method of forming a gate oxide layer on a semiconductor substrate comprising forming an oxide layer on the substrate by oxidizing the substrate in a chemical vapor deposition furnace, introducing nitric oxide (NO) gas into the chemical vapor deposition furnace, and nitriding the oxide layer in the presence of the nitric oxide gas. Neither does Oya et al. teach or suggest a method of nitriding a gate oxide layer on a semiconductor substrate comprising nitriding the gate oxide layer in the presence of nitric oxide (NO) gas wherein the nitriding step is conducted at a temperature of about 800°C or less and at a pressure of about 1 atm or less in a chemical vapor deposition furnace.

The secondary references all fail to cure this deficiency in Oya et al. Applicants submit that the Examiner has not yet set forth a *prima facie* case of obviousness. The PTO has the burden under § 103(a) to establish a *prima facie* case of obviousness. In re Fine, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988). Both the case law of the Federal Circuit and the PTO itself have made clear that where a modification must be made to the prior art to reject or invalidate a claim

under § 103(a), there must be a showing of proper motivation to do so. The mere fact that a prior art reference could be modified to meet the claim is insufficient to establish obviousness. The PTO "can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references." Id. In order to establish obviousness, there must be a suggestion or motivation in the reference to do so. *See* Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 15 U.S.P.Q.2d 1321 (Fed. Cir. 1990); *see also* In re Gordon, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984) (prior art could not be turned upside down without motivation to do so).

Reconsideration and withdrawal are respectfully requested.

Finally, on a procedural note Applicants note that the outstanding Office Action takes Official Notice for the **first** time in prosecution in the context of a final rejection in the outstanding Office Action at page 8, lines 1-3 in stating "[a]s to the proposed distinction between a diffusion furnace and a CVD furnace, the Examiner notes that it is well known within the art that a diffusion furnace and a CVD furnace are equivalent." In support of this erroneous statement, the Office Action restates the same misplaced reliance to Oya et al, set forth above and restated below.

> According to the present invention, a CVD oxide film as a tunnel oxide film is formed in **a low pressure CVD furnace** by a low pressure CVD method and then **subjected to heat treatment in a LPCVD furnace in a nitriding atmosphere.** Accordingly, the CVD oxide film can be nitrided, so that the film quality of the CVD oxide film can be improved. Furthermore, the ratio at which electric charges (electrons) flown out from the floating gate at the time of erasing operation are trapped in the CVD oxide film can be reduced
>
> (See col.10, ll.59-68)

In the above citations from Oya et al, although cited for this proposition in the outstanding Office Action, there is no teaching of introducing nitric oxide (NO) into a Chemical Vapor

Deposition (CVD) furnace. Nitric Oxide simply is not disclosed. In addition, the contention that a diffusion furnace and a chemical vapor deposition furnace are recognized in the art as equivalent is simply not reasonable. A diffusion furnace and a chemical vapor deposition furnace have distinct functions, objects and effects.

Accordingly, Applicant traverses this Official Notice and requires withdrawal of finality and supplementation of the record with a reference to establish the proposed equivalence in the context of an Office Action not under final rejection to provide Applicant fair opportunity of rebuttal.

CONCLUSION

All rejections having been addressed by the present amendments and response, Applicants submit that the present case is in condition for allowance and respectfully request early notice to that effect. If any issues remain to be addressed in this matter which might be resolved by discussion, the Examiner is respectfully requested to call Applicants' undersigned counsel at the number indicated below.

Respectfully submitted,

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